

DOI:10.11931/guihaia.gxzw201909027

Discovery of *Paraboea minutiflora* (Gesneriaceae) from southeastern Yunnan, China with supplementary descriptionLU Zhaoen¹, LIU Ende², HAN Mengqi³, ZHU Xinxin⁴,NGUYEN Khang Sinh⁵, XU Weibin¹*

(1. Guangxi Key Laboratory of Plant Conservation and Restoration Ecology in Karst Terrain, Guangxi Institute of Botany, Guangxi Zhuang Autonomous Region and Chinese Academy of Sciences, Guilin 541006, China; 2. Key Lab of Biodiversity and Biogeography, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming, 650201, China; 3. State Key Laboratory of Systematic and Evolutionary Botany, Institute of Botany, Chinese Academy of Sciences, Beijing, 100093, China; 4. College of Life Sciences, Xinyang Normal University, Xinyang, 464000, China; 5. Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Cau Giay, Ha Noi, Vietnam.)

Abstract: *Paraboea minutiflora* D.J. Middleton was collected firstly from northern Vietnam in 2001 and was published in 2018, but it is incomplete and lacks type specimens with mature flowers when reported. The description of *Paraboea minutiflora* was supplemented base on the collections from southeastern Yunnan, China and Ha Giang, Vietnam, and line drawing and photos are also provided.

Key words: biodiversity hotspot, limestone flora, Sino-Vietnamese limestone karst

微花蛛毛苣苔在中国云南的发现及其补充描述陆昭岑¹, 刘恩德², 韩孟奇³, 朱鑫鑫⁴, Khang Sinh Nguyen⁵, 许为斌¹*

(1. 广西喀斯特植物保育和恢复生态学重点实验室, 广西壮族自治区中国科学院广西植物研究所, 广西 桂林 541006; 2. 东亚植物多样性与生物地理学重点实验室, 中国科学院昆明植物研究所, 云南 昆明 650201; 3. 系统与进化国家重点实验室, 中国科学院植物研究所, 北京 100093; 4. 信阳师范学院, 生命科学学院, 河南 信阳 464000; 5. 越南科学技术研究院 生态与生物资源研究所, 越南 河内)

摘要: 中越边境喀斯特地区是全球生物多样性热点地区, 也是生物多样性保护的关键区域, 近年来在该地区发现了多个蛛毛苣苔属植物的新种。微花蛛毛苣苔于 2001 年在越南北部喀斯特地区首次采集到标本, 直到 2018 年才被发表出来, 然而发表时仅基于一号花发育未成熟的标本, 故该物种的诸多形态特征仍不清楚。作者开展中越边境喀斯特地区植物多样性调查时, 在我国云南东南部也发现了微花蛛毛苣苔, 并采集到花发育成熟的植株, 对其进行了解剖观察和测量, 现对该物种进行补充描述, 并提供墨线图和野外生态照片以资辨认。

关键词: 生物多样性热点, 石灰岩植物区系, 中越边境喀斯特地貌

基金项目: 国家自然科学基金 (31400183, 31860043); 中央引导地方科技发展专项资金 (桂科 ZY1949013); 广西重点研发计划项目 (桂科 AB16380256) [Supported by the National Natural Science Foundation of China (Grant no. 31400183 and 31860043), the Special Funds for Local Science and Technology Development Guided by the Central Committee (ZY1949013), Guangxi key research and development program (Guike AB16380256)].

作者简介: 陆昭岑(1990-), 女, 广西容县人, 硕士, 主要从事植物分类学和民族植物学研究, (E-mail) zhaocenlu@163.com。

* **通信作者:** 许为斌, 博士, 副研究员, 主要从事植物分类学和生物地理学研究, (E-mail) gxibwbxu@163.com。

Sino-Vietnamese limestone karsts are biodiversity hotspots in the world (Myers et al., 2000; Clements et al., 2006), and many new species in the genus *Paraboea* (C.B. Clarke) Ridl. have been found there (Chen et al., 2008, 2012; Xu et al., 2012, 2017; Wen et al., 2013, 2016; He et al., 2018; Middleton, 2018). *Paraboea minutiflora* was reported from Ha Giang, northern Vietnam in 2018. But *Paraboea minutiflora* just only has slightly immature corollas on the specimens available for study when published (Middleton 2018), so it is very important to give supplementary description for this insufficiently understood species. According to the original literature and specimens from southeastern Yunnan, China, the characteristics of *Paraboea minutiflora* are described, and line drawing and photos are also provided.

Paraboea minutiflora D. J. Middleton in Edinb. J. Bot., 75: 423. 2018.

微花蛛毛苣苔 (新拟) (Figs 1, 2, 3)

Perennial erect herb with obviously (sometimes inconspicuous) woody rootstock. Rhizomes subterete, 14–40 cm long, 5–12 mm in diameter. Leaves 6–8, congested at the apex of rhizome, long petiolate, petiole 5.5–20 cm long, 1.5–4 mm in diameter, covered with grayish to brownish matted indumentum, leaf blade 9.4–19.4 × 5.7–19.2 cm, broadly lanceolate, ovate to broadly ovate, papery, base truncate to cordate, sometimes inequilateral, apex apiculate, cuspidate to almost rounded, margin entire to minutely crenulate, upper leaf surfaces covered with brown matted indumentum when young, but glabrescent at maturity, lower leaf surfaces with brown matted indumentum, lateral veins 7–9 on each side of midrib, flat adaxially and prominent abaxially, tertiary venation conspicuously reticulate on the lower leaf surface. Inflorescences cymose, terminal (rare subterminal), with distantly spaced branches, 26.1–36 cm long, 3–4-branched, ca. 30–100 flowers; peduncle 9.5–19 cm long, 5–10 mm in diameter, with a dense matted indumentum in lower parts, glabrescent distally, and then red-purple shiny; bracts 2, opposite, green, lower pair 11–41 × 5–29 mm, upper pairs progressively smaller; pedicels 2–10 mm long, ca. 1 mm in diameter, glabrous. Calyx green, 5-parted nearly to the base, lobes oblong, reflexed, 3–3.5 × 0.8–1.2 mm, outside and inside glabrous, margins entire, apex rounded. Corolla 9–12 mm long, obliquely campanulate, white and red-pink or pale purple-blue, densely glandular-pubescent outside, glabrous or sparsely pubescent inside; tube 6–8 mm long, 4–6 mm in diameter at the mouth; the limb conspicuously 2-lipped, adaxial lip 2-lobed to near base, lobes round, 3–4 × ca. 3 mm, abaxial lip 3-lobed to over middle, lobes round, 3.5–4.5 × ca. 3.5 mm. Stamens 2, adnate to the corolla base; filaments 4–4.5 mm long, densely glandular-bearded at the middle; anthers adnate face to face, elliptic, 3.0–3.3 mm long, glabrous; staminodes 3, glandular-puberulent, lateral ones 1.0 mm long, adnate to ca. 1 mm above the corolla tube base; middle one ca. 0.2 mm long, adnate to the corolla tube base. Pistil glabrous, ovary 4–5 mm long, ca. 1.5 mm in diameter, style 4–5 mm long, stigma slightly capitate. Capsule straight, 1.2–2.8 cm long, ca. 2 mm in diameter, glabrous (old dehiscent fruit).

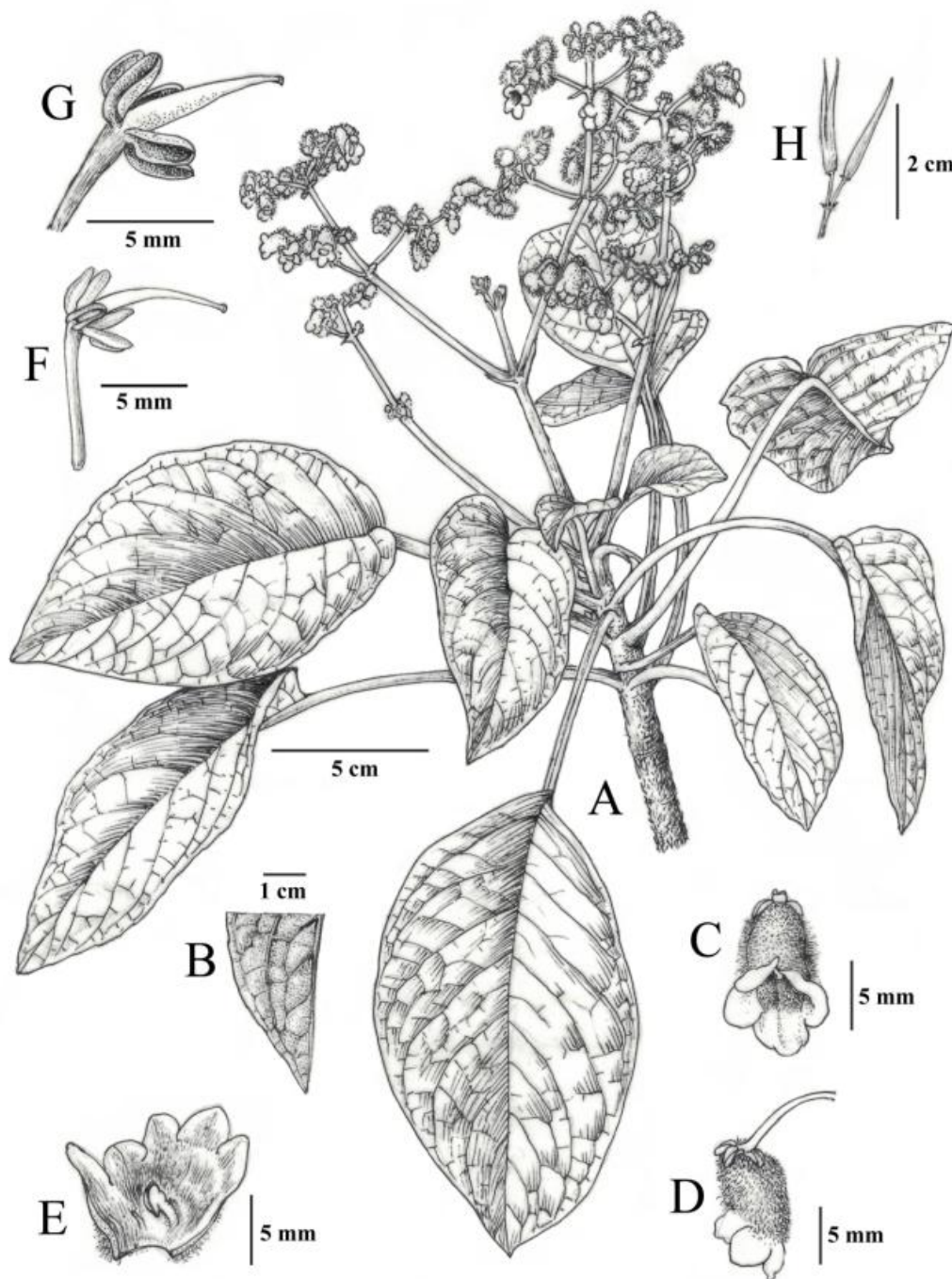


Fig. 1 *Paraboea minutiflora* A. Habit; B. A part of lower surface of leaf blade; C. Flower face view; D. Flower side view; E. Opened corolla showing stamens and staminodes; F, G. Calyx and pistil; H. Capsules. (Drawn by W.-H. Lin)

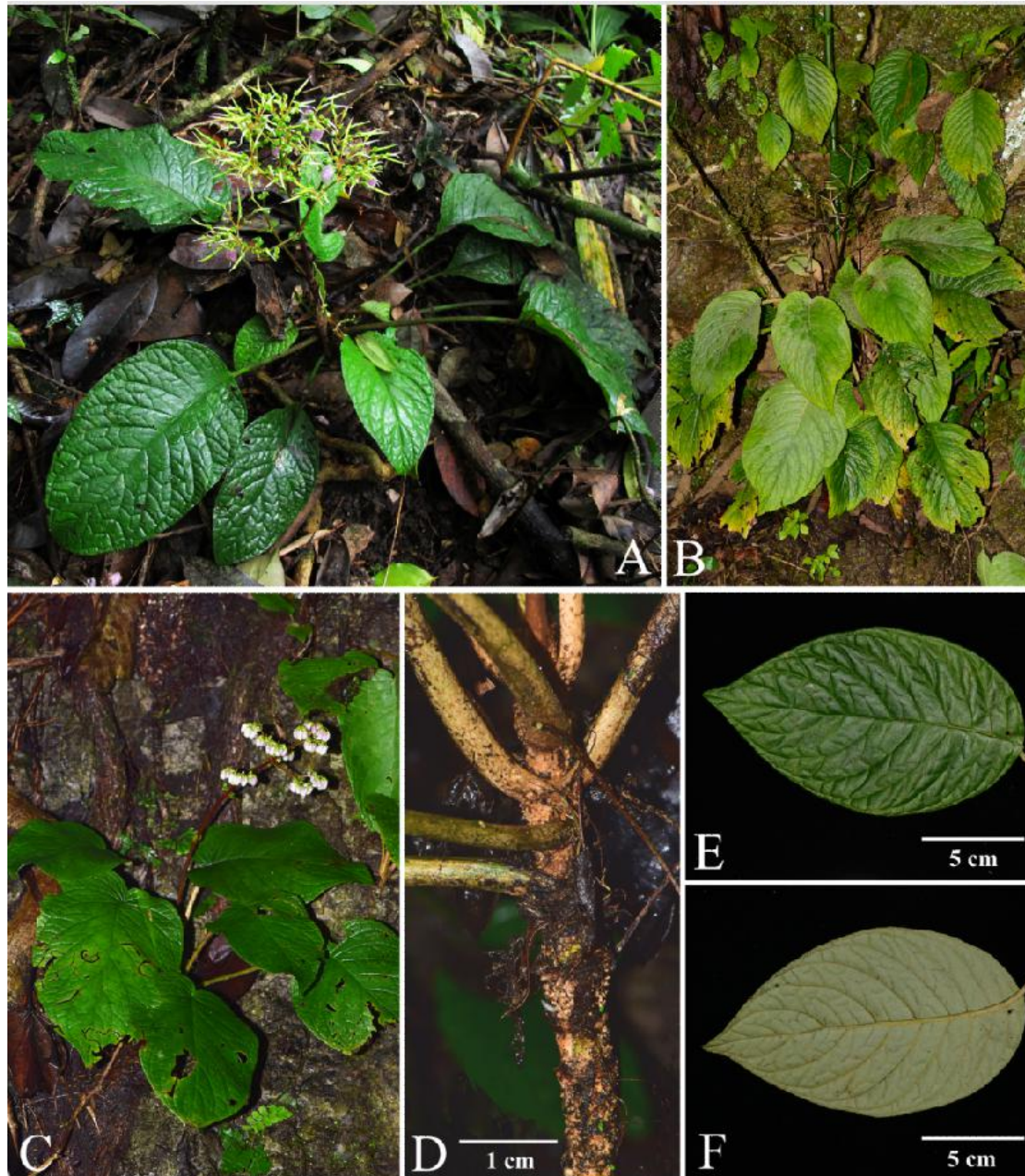


Fig. 2 *Paraboea minutiflora* A. Habit with young fruits and flowers; B. Habit with old dehiscent fruits; C. Habit with flowers; D. A part of rhizome; E. Upper surface of leaf blade; F. Lower surface of leaf blade.

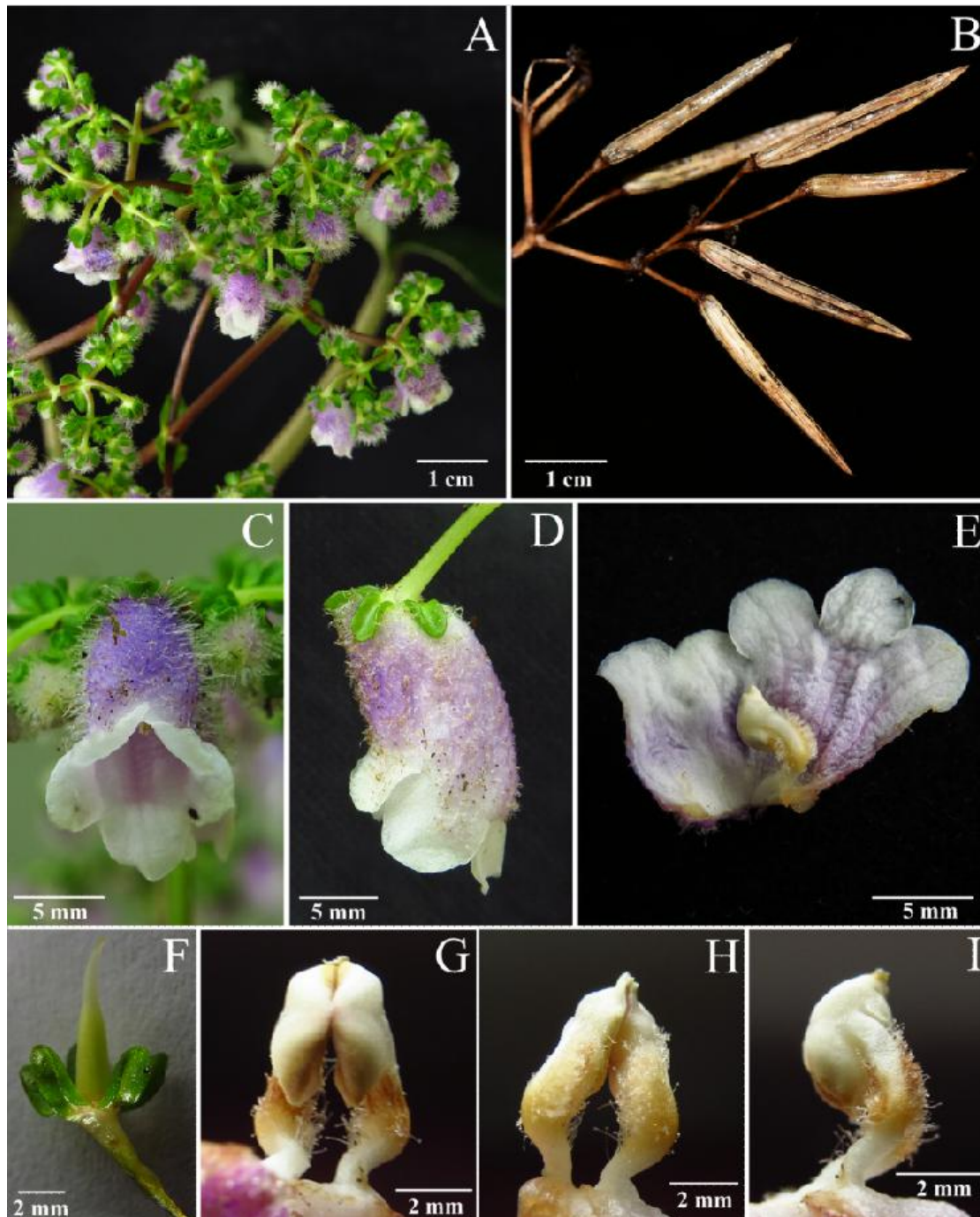


Fig. 3 *Paraboea minutiflora* A. A part of inflorescences; B. Capsules. C. Flower face view; D. Flower side view; E. Opened corolla showing stamens and staminodes; F. Pistil and calyx; G. Stamens face view; H. Stamens back view; I. Stamens side view.

Distribution and habitat: *Paraboea minutiflora* is found from Ha Giang, northern Vietnam and southeastern Yunnan, China, and only four localities have so far been identified during field investigations. *Paraboea minutiflora* grows under the forests of limestone karst, at an elevation between 600 m and 1 100 m.

Phenology: Flowering from February to June.

Notes: *Paraboea minutiflora* is similar to *Paraboea thorelii* (Pellegr.) B. L. Burtt and species in the *Paraboea martinii* (H. Lev. & Vaniot) B. L. Burtt group, but it is easily distinguished from the latter by some characters (Middleton 2018). *Paraboea minutiflora* is also most similar to *Paraboea glanduliflora* Barnett in having glabrous, reflexed calyx and corolla with glandular hairs (Xu et al., 2008; Wang et al., 2012), but differs from the latter by the upper leaf surfaces covered with brown matted indumentum when young, but glabrescent at maturity (vs. pubescent), the inflorescences terminal (vs. subterminal), the corolla 9–12 mm long (vs. 18 mm long), the capsule straight, 1.2–2.8 cm long (vs. spirally twisted, 3–4 cm long).

Additional specimens examined:—CHINA. **Yunnan:** Malipo County, Tianbao Town, N22° 59' 24.20" , E104° 50' 12.14" , alt. 1 100 m, 20 June 2018, Meng-Qi Han & Wei-Bin Xu 13883 (IBK). The same locality, 10 January 2019, Xin-Xin Zhu & Wei-Bin Xu 13916 (IBK). VIETNAM. **Ha Giang:** Quan Ba, E104° 56' 01.4" , N23° 02' 55.0" , alt. 900–980 m, 18 October 2018, Leonid V. Averyanov et al. VR1000 (LE01049022); Phong Quang, E104° 54' 57.4" , N22° 53' 51.5" , alt. 650 m, 17 August 2019, Wei-Bin Xu et al. 13931 (IBK & HN).

The flora of Sino-Vietnamese limestone karsts belongs to the Tonkin gulf Region in Paleotropic Kingdom (Wu et al., 2010), and also rich in rare and endemic plants. In recent years, many new genera or species were found firstly from northern Vietnam, and also found from southern or southwestern China at last, e.g. *Caobangia* A.R. Smith & X. C. Zhang (Xu et al., 2008), *Xanthocyparis* Farjon & Hiep (Meng et al., 2013), *Zeuxinella* Aver. (Huang et al., 2012), *Aspidistra connata* H.-J. Tillich (Xu et al., 2010), *Didymoplexis vietnamica* Ormd. (Huang et al., 2011), *Sciaphila stellata* Aver. (Jiang et al., 2011), and also including *Paraboea minutiflora* D.J. Middleton here. The discovery of *Paraboea minutiflora* D. J. Middleton from southeastern Yunnan, China enlarge its distribution localities, and also important to its research and conservation. Its biogeographical significance here, the flora is closely interrelated between the southern and southwestern limestone karsts of China and the northern limestone karsts of Vietnam. The Sino-Vietnamese limestone karsts are naturally integrated areas, and the border just an artificial line, can not give salient vicariations to those local wildlife. The biodiversity of Sino-Vietnamese limestone karsts is so fantastic, but the field surveys are weakness, even blank in some areas, and many species face to severe threats at the same time, so more further research and conservation works are needed.

Acknowledgements

The authors are grateful to Mr. Wen-Hong Lin (IBK) for the beautiful drawing, to Dr. Lei Wu (CSFI) for his beautiful photo. This study was supported by the National Natural Science Foundation of China (Grant no. 31400183 and 31860043), and in part by the Special Funds for Local Science and Technology Development Guided by the Central Committee (ZY1949013), and Guangxi key research and development program (Guike AB16380256).

References:

- CHEN WH, MOLLER M, SHUI YM, et al., 2008. A new species of *Paraboea* (Gesneriaceae) from a karst cave in Guangxi, China, and observations on variations in flower and inflorescence architecture [J]. Bot J Linn Soc, 158: 681–688.
- CHEN WH, MOLLER M, ZHANG MD, et al., 2012. *Paraboea hekouensis* and *P. manhaoensis*, two new species of Gesneriaceae from China [J]. Ann Bot Fenn, 49: 179–187.
- CLEMENTS R, SODHI NS, SCHILTHUIZEN M, et al., 2006. Limestone karsts of Southeast Asia: imperiled arks of biodiversity [J]. Bioscience, 56: 733–742.
- HE DM, FENG YF, PAN FZ, et al., 2018. *Paraboea wenshanensis*, a new species of Gesneriaceae from Yunnan, China [J]. PhytoKeys, 95: 83–91.
- HUANG YF, WU L, LIU Y, 2012. *Zeuxinella*, a new recorded genus of Orchidaceae from China [J]. J Trop Subtrop Bot, 20(2): 132–134. [黄云峰, 吴磊, 刘演, 2012. 中国兰科一新记录属—拟线柱兰属 [J]. 热带亚热带植物学报, 20(2): 132–134.]
- HUANG YS, LU MX, YANG JC et al., 2011. *Didymoplexis vietnamica*, a newly recorded species of *Didymoplexis* (Orchidaceae) from China [J]. Guihaia, 31(5): 578–580. [黄俞淞, 陆茂新, 杨金财, 等, 2011. 中国双唇兰属 (兰科)一新记录种—越南双唇兰 [J]. 广西植物, 31(5): 578–580.]
- JIANG RH, WU WH, NONG DX, et al., 2011. *Sciaphila stellata* Aver., a newly recorded species of Triuridaceae from limestone areas in China [J]. Guihaia, 31(1): 9–10. [蒋日红, 吴望辉, 农东新, 等, 2011. 中国石灰岩地区霉草科一新记录种—星状霉草 [J]. 广西植物, 31(1): 9–10.]
- MENG T, PENG RC, CHUNG KF, et al., 2013. *Xanthocyparis* Farjon & Hiep, A Newly Recorded Genus of Cupressaceae from China [J]. Guihaia, 33(3): 388–391. [蒙涛, 彭日成, 钟国芳, 等, 2013. 黄金柏属—中国柏科一新记录属. 广西植物, 33(3): 388–391.]
- MIDDLETON DJ, 2018. Two new species of *Paraboea* (Gesneriaceae) from Vietnam [J]. Edinb J Bot, 75: 421–425.
- MYERS N, MITTERMEIER RA, MITTERMEIER CG, et al., 2000. Biodiversity hotspots for conservation priorities [J]. Nature, 403: 853–858.
- WANG HC, SUN H, ZHOU XM, et al., 2012. *Paraboea glanduliflora*, a newly recorded species of *Paraboea* (Gesneriaceae) from China [J]. Guihaia, 32: 756–758.
- WEN F, HONG X, CHEN LY, et al., 2013. A new species of *Paraboea* (Gesneriaceae) from a karst limestone hill in southwestern Guangdong, China [J]. Phytotaxa, 131: 1–8.
- WEN F, WEI YG, 2016. *Paraboea yunfuensis*: a new calcicolous species of Gesneriaceae from Yunfu, Guangdong Province, China [J]. Telopea, 19: 125–129.
- XU WB, GUO J, PAN B, et al., 2017. Three new species of *Paraboea* (Gesneriaceae) from limestone karsts of China based on morphological and molecular evidence [J]. Bot Stud, 58: 56.
- XU WB, HUANG YS, WEI GF, et al., 2012. *Paraboea angustifolia* (Gesneriaceae): a new species from limestone areas in northern Guangxi, China [J]. Phytotaxa, 62: 39–43.

- XU WB, HUANG YS, YE XX, et al., 2010. *Aspidistra connata* H.-J. Tillich, a newly recorded species of *Aspidistra* (Ruscaceae) from China [J]. Guihaia, 30(5): 613–615. [许为斌, 黄俞淞, 叶晓霞, 等, 2010. 中国蜘蛛抱蛋属一新记录种——合瓣蜘蛛抱蛋 [J]. 广西植物, 30(5): 613–615.]
- XU WB, LIANG YY, ZHANG XC, et al., 2008. *Caobangia* A.R. Smith & X.C. Zhang (Polypodiaceae): A newly recorded fern genus from China [J]. Acta Phytotaxon Sin 46(6): 916–918. [许为斌, 梁永延, 张宪春, 等, 2008. 中国水龙骨科一新记录属——高平蕨属 [J]. 植物分类学报, 46(6): 916–918.]
- XU ZR, BURTT BL, SKOG LE, et al., 2008. A revision of *Paraboea* (Gesneriaceae) [J]. Edinb J Bot, 65: 161–347.
- WU ZY, SUN H, ZHOU ZK, et al., 2010. Floristics of seed plants from China [M]. Beijing: Science Press: 100–102 [吴征镒, 孙航, 周浙昆, 等, 2010. 中国种子植物区系地理 [M]. 北京: 科学出版社: 100–102.]